# UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
# WASHINGTON, D.C. 20460

**OFFICE OF PREVENTION PESTICIDES AND TOXIC SUBSTANCES**

**Memorandum**

**Date:** August 29, 2001

**SUBJECT:** Initial Biological and Economic Analysis of Azinphos-methyl on Melons: Watermelon, Honeydew, and Cantaloupe

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**Summary**

Phosmet is not registered for use on melons. Therefore this assessment will address only azinphos-methyl use on this crop group.

In Arizona the area where there is the only significant azinphos-methyl usage, there would likely be little or no grower impact on

the melon industry, or curtailment of the melon supply if azinphos-methyl were lost as long as alternatives such as endosulfan or methomyl are available.

**Background**

Azinphos-methyl is applied to melons to control a complex of cucumber beetles, flea beetles, whiteflies, and aphids. Melons are produced in several states in the U.S. Less than 1% of the national acreage of melons is treated with azinphos-methyl, however 2.6% of the Arizona combined melon acreage is treated with azinphos-methyl. BEAD predicts that there will be no impact on melon production if azinphos-methyl restricted entry intervals are extended because most growers are already using other active ingredients to control the pest complex on melons.

**Production**

In 1999, the U.S. harvested 313,550 acres of melons and production was 70,333,000 cwt. In 1999, 95% of the watermelon acres and production were in the combined areas of the Southeast (FL, GA, NC, SC, AL, MS), South Central (TX, OK), Southwest (AZ, CA), and North Central (IN, MO). For cantaloupes, 95% of acreage and production was in the combined areas of CA, AZ, TX, GA, CO, MI, and IN. California production alone accounts for approximately 60% of total U.S. cantaloupe production. For honeydews, 95% of the acreage and production was in the combined areas of CA, AZ, and TX. Acreage in production in CA and AZ has increased more than 15% between 1992 and 1997. About 99% of melon production is for the fresh market. Nationally, less than 1% of cantaloupe, honeydew, or watermelon national acreage was treated with azinphos-methyl in 1998.

**Production Practices**

Melon crops are established using transplants and direct seeding in about equal proportions. Most of the azinphos-methyl applications are made immediately after seedlings are transplanted in the field. Worker activity in the fields around this time includes hand hoeing. In Arizona, 2-7 days after insecticide application, hand thinning, removal and placement of irrigation pipe, and tractor cultivation are generally done. Hand turning trailing vines up onto the rows is done several weeks after this in some areas. Hand hoeing is probably done on very few acres but turning is done on a significant amount of the acreage. Most irrigation activities do not involve workers entering fields.

**Use of Azinphos-methyl and Phosmet on Melons**

The only important use of azinphos-methyl is on Arizona melons. Nationally, less than 1% of cantaloupe, honeydew, or watermelon acreage was treated in 1998, but about 2.6% of the overall melon acreage was treated in Arizona. In MI, TX, MD, OK, IN, NC, and FL, less than 1% of the watermelon acreage was treated. Although California accounted for most of the honeydew and cantaloupe acreage in production in 1999, CA reported a total of only 10 pounds of azinphos-methyl used on 14 acres.

The primary target pests for the use of azinphos-methyl are the cucumber beetle complex, flea beetles, whiteflies, and melon aphids. Secondary pests not specifically targeted include squash bugs, crickets, and armyworms. About 90% of the usage is for cucumber beetle. These beetles are both a direct defoliator and a vector for bacterial wilt disease in cantaloupes and honeydews. Cucumber beetles appear in the early growth stages and can persist all season. For all types of melons, typical insecticide application occurs just after transplanting or when seedlings appear. Usually one foliar application adequately controls cucumber beetles.

For all types of melons, other insecticides are preferred to azinphos-methyl for control of these pests (Table 1).

Table 1. Melon target pests, alternatives, and the percent crop treated.

| Pest | Control Alternative and estimated range of percent crop treated (PCT) | |
|---|---|---|
| cucumber beetle | endosulfan | 8-14% PCT |
| | esfenvalerate | 4-15% PCT |
| | permethrin | 6-13% PCT |
| | carbaryl | 7-19% PCT |
| | methomyl | 13-15% PCT |
| | imidacloprid | 1-39% PCT |
| | carbofuran | 3% PCT |
| | azinphos-methyl | < 1 % |
| Whitefly and aphid | the above plus | |
| | abamectin | 2-10% PCT |
| | malathion | 1% PCT |
| | oxamyl | 1% PCT |
| | dimethoate | 3-19% PCT |
| | bifenthrin | 1-11% PCT |

The efficacy of the above active ingredients is as good or better than azinphos-methyl and there are no significant constraints on their use compared to azinphos-methyl (Table 1). The efficacy of imidacloprid and carbofuran applied at plant for the key pest, cucumber beetle, is superior to azinphos-methyl.

Azinphos-methyl is the product of choice for cucumber beetle on cantaloupe and honeydew in Arizona. The analysis was based on the following assumptions.

- In 1998, AZ produced 20.4% of the U.S. cantaloupes (2$^{nd}$ after CA) and 15.3% of the U.S. honeydews (2$^{nd}$ after CA).
- About 2.6% of the AZ melon acreage was treated (3.3% of the 18,500 cantaloupe acres were treated with a total about 200 lb ai applied at 0.34 lb ai/acre in a single application and approximately 1.8% of the 3,850 honeydew acres were treated once at a rate of 0.25 lb ai/acre).
- Cucumber beetle is the key target pest, treated with 1 application usually made to seedlings.
- The overall mean application rate on melons is 0.34 lb ai/acre.
- Application method is banded, ground directed on 80" beds.
- The crop cycle is 75 days and there are 2 crop cycles per year.
- If plants are lost early, replanting is possible although increased costs are incurred.

**Restricted Entry Intervals (REIs)**

Current azinphos-methyl labels for all products have a 2 day REI for mowing, scouting, and irrigating (3 days in localities with average annual rainfall less than 25 inches) and a 4 day REI for other activities (5 days in localities with less than 25 inches

average annual rainfall).

Please refer to the occupational and residential human health risk assessment on the Agency's website (http://www.epa.gov/pesticides/op) for information concerning the worker risks associated with the restricted entry intervals for this chemical.

**Impacts Related to REI Mitigation**

If the REIs for azinphos-methyl are extended beyond 7 days, there will likely be very little impact on the production or quality of melons or watermelons for more than 95% of the production areas. Most growers still using azinphos-methyl will move to one of the other insecticides already available. These active ingredients are currently the controls of choice and have shorter REIs than the current REIs for azinphos-methyl.

In Arizona, hand thinning, removal and placement of irrigation pipe, and tractor cultivation are the worker activities that take place 2-7 days after application. An REI of greater than 7 days would force growers to use alternatives with shorter REIs. There will likely be insignificant impacts on production or quality of melons. Growers will readily switch to methomyl and endosulfan, which are the standard chemicals.

**Cost Impacts**

The combined melon market in Arizona averages annual total gross revenues of approximately $92.3 million for Arizona cantaloupe producers using the current control methods. Estimates for impacts to Arizona melon growers are expected to be minimal because: azinphos-methyl usage accounts for only 2.6% of the total melon acreage usage, with 3.3% of the cantaloupe and 1.1% honeydew acres treated, respectively.

There are several chemicals currently available that are very similar in cost and equally or more efficacious than azinphos-methyl (Tables 1 & 2). Growers are already using the other products available for cucumber beetle complex, flea beetle, whitefly, and aphids because they are the controls of choice and currently have shorter REIs than the current REIs for azinphos-methyl.

As long as endosulfan or methomyl are available, and growers can shift to another control, there will be no expected impact. Treatment costs are similar, efficacy is as good or better than azinphos-methyl, and there is currently minimal use of azinphos-methyl on melons, so market disruptions are not expected.

Table 2. Costs of Insecticides on Melons.

| Alternative | Average Cost ($) Per Acre | |
|---|---|---|
| Abamectin | 32.26 | 31.79 - 32.73 |
| Azinphos-methyl | 8[1] | 8 |
| Bifenthrin | 13.69 | 11.97 - 15.41 |
| Carbaryl | 9.7 | 5. 71 - 13.68 |
| Carbofuran | 14.13 | 12 - 16.26 |
| Dimethoate | 3.25 | 3.13 - 3.37 |

[1]Source:USDA, Ag. Stats., 2000, no range given.

| | | |
|---|---|---|
| Endosulfan | 8.5 | 6.86 - 10.23 |
| Esfenvalerate | 6.3 | 6.27 - 6.34 |
| Imidacloprid | 64.27 | 61.31 - 67.23 |
| Malathion | 4.78 | 4.28 - 5.27 |
| Methomyl | 9.12 | 6.47 - 11.77 |
| Oxamyl | 19.55 | 13.81 - 25.3 |
| Permethrin | 6.67 | 6.52 - -6.81 |

**Control Alternative Comparisons**

In Arizona, methomyl, applied at an average rate of 0.72 lb ai/acre [3.5% CT] and endosulfan, applied at a rate of 0.73 lb ai/acre [32% CT] are alternatives to azinphos-methyl that must have 2 applications to achieve the same control. Carbaryl [0.81 lb ai/acre], esfenvalerate [0.04 lb ai/acre], and permethrin [0.18 lb ai/acre] also have very minor usage (See Table 3 below).

Table 3. The average rate and percent crop treated for active ingredients registered for melons.

| Control Alternative Compared to Azinphos-methyl | Average Rate | Number of Applications | Percent Crop Treated (PCT) |
|---|---|---|---|
| Methomyl | 0.72 lb ai/acre | 2 | 3.5% PCT |
| Endosulfan | 0.73 lb ai/acre | 2 | 32% PCT |
| Carbaryl | 0.81 lb ai/acre | N/A | N/A |
| Esfenvalerate | 0.04 lb ai/acre | N/A | N/A |
| Permethrin | 0.18 lb ai/acre | N/A | N/A |

**Characterization of Impacts on Crop**

In Arizona, the area where there is the only significant azinphos-methyl usage, there would likely be little or no grower impact on the melon industry, or curtailment of the melon supply if azinphos-methyl were lost, as long as alternatives such as endosulfan or methomyl are available.

**Resources**

USDA Crop Profiles for Honeydew, Cantaloupe, or Watermelon for AZ, CA, TX, MD, IN, DE, NC, OK, and Guam. 1999-2000. Internet 4/10/01.

USDA, NASS, Agricultural Chemical Usage. 7/99.

USDA, Agricultural Statistics, 2000.

AZ Cooperative Extension., Department of Ag and Resource Economics, University of Arizona; Income and Cash Operating Summaries Cantaloupe and Honeydew for 1998. Internet 4/11/01.

CA DPR. Pesticide Use Report Cantaloupe, Melon, and Watermelon for 1999. 2000. Internet 4/11/01.

EPA proprietary source for 1999. 2000.

Gianessi, L. The uses and benefits of organophosphate and carbamate insecticides in U.S. crop production. 12/97.

Yusuf, I. And Kiely, T., EPA/OPP. Quantitative Usage Analysis Azinphos-methyl. 4/99.